REPORT OF THE COMMITTEE APPOINTED BY GOVT FOR THE DEVELOPMENT OF IRRIGATION UNDER THE KRISHNA-RAJASAGARA CAUVERY RESERVOIR

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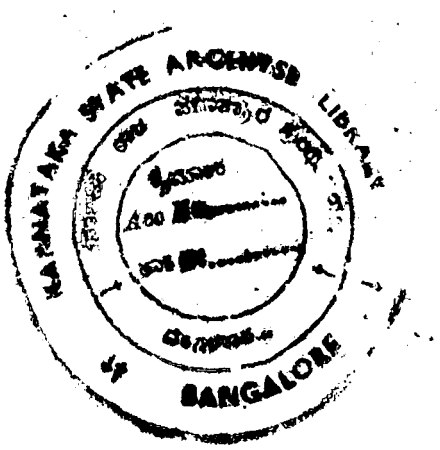

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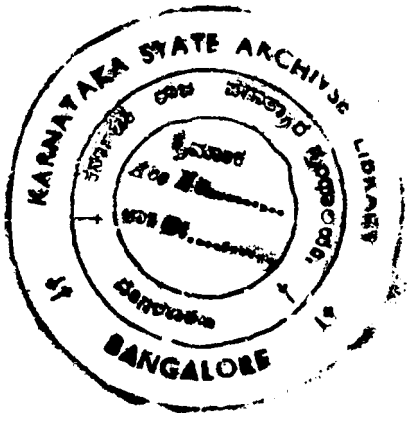
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REPORT OF THE COMMITTEE APPOINTED BY GOVERNMENT FOR THE DEVELOPMENT OF IRRIGATION UNDER THE KRISHNA-RAJASAGARA—(CAUVERY RESERVOIR). MAY 1927.

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1. Report of the Committee.

2. Copy of D. O. letter No. 1354, dated 21st May 1927 from the Chief Electrical Engineer to the Special Officer, Krishnarajasagara Works, giving particulars of outlay and revenue for the power scheme.

3. List of reports, plans, etc., comprising the High Level Canal Project.

4. Note dated 22nd May 1927 by Mr. K. R. Srinivasiengar.

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REPORT

OF THE COMMITTEE APPOINTED BY GOVERNMENT FOR THE DEVELOPMENT OF IRRIGATION UNDER THE KRISHNARAJASAGARA (CAUVERY RESERVOIR).

Government appointed this Committee in G. O. No. 27-34—K. S. S. 94-101, dated the 9th July 1927. Their instructions to the Committee were, to advise Government as to the measures necessary for the development of irrigation under the Cauvery Reservoir, and particularly, as to the scope of the scheme to be sanctioned, and to submit a programme for grants and execution.

2. The Committee held their first meeting in July last and decided upon the lines on which the further revision of the project for a High Level Canal on the north bank of the river should be undertaken. After investigations extending over about eight months, the Special Officer has submitted a Canal Project, which with the exception of certain details yet to be elaborated for the third section of the canal, may be considered to be complete. The Committee are now in a position to submit specific recommendations for the execution of the project.

PROGRESS ON THE SCHEME.

3. The original Cauvery Reservoir Scheme was sanctioned by Government in G. O. No. 13-19—84-90, dated 12th October 1911 and the construction of the dam was commenced in November of the same year.

The works contemplated in the original scheme were:—

(1) Construction of a reservoir on the Cauvery river.
(2) Generation of additional Hydro-Electric power at the Cauvery falls at Sivasamudram and elsewhere.
(3) Development of Irrigation in the Cauvery Valley.

4. The first of these works, *viz.*, the construction of a reservoir dam with the modifications since agreed to with the Madras Government is approaching completion and a sum of about Rs. 220 lakhs has been spent on it. The works which still remain to be completed on the dam are the installation of automatic waste weir gates, protective works for the weir channel, completion of parapet walls, final settlement of land compensation and a few other minor items.

These unfinished works will require an outlay of about Rs. 30 lakhs at the outside so that the total expenditure on the dam is expected to amount to Rs. 250 lakhs.

5. As regards the development of hydro-electric power, the reservoir, besides guaranteeing the power (about 10,000 H. P.) generated before its construction was taken in hand, has enabled four more power installations to be added, resulting in an increase of 36,000 H. P. The last of these installations which is for a block of 14,000 H. P. is in progress and will be shortly completed. It will be seen that the electrical portion has developed rapidly, and indeed has already gone far beyond the intentions of the original scheme.

It may be observed in this connection, that favourable sites for power generation exist in two other places along the banks of the river, *viz.*, at the Shimsha falls and Mekadatu. These sites may be utilised with advantage when demand arises for more power. If, for instance, the generating station is transferred to the Shimsha falls, the power generated will be at least 50 per cent more than that at present obtained at Sivasamudram for the same quantity of water.

6. The progress made so far, in the direction of the development of irrigation, consists in opening two low level canals from the Reservoir at a cost of Rs. 3·8 lakhs. The additional irrigation secured by this means is only about 5,000 acres.

Development of Irrigation.

7. Investigations have been in progrees from time to time since 1911 for the preparation of suitable schemes for the development of irrigation, and every canal project possible under the Krishnarajasagara as well as under the additional reservoirs which Mysore is entitled to construct under the Madras Agreement, has been examined. These have proved conclusively that extension of irrigation under the reservoir on a large scale and in a satisfactory manner, is possible only on the north bank of the river, and that resort to a canal on this bank is the only course open, if the additional total extent of irrigation provided in the Agreement or even the area permissible under the Krishnarajasagara, is ever to be realised. For this purpose the High Level Canal project now before the Committee has been prepared. The project was examined by the late Sir M. Nethersole (formerly Inspector-General of Irrigation in India) who, at the request of the Government, visited the site of the proposed works in 1917, and the main features of the project as modified on the lines suggested by him, have been approved by the Special Committee appointed by Government in 1921.

8. The Canal commands a culturable area of about 300,000 acres up to the Shimsha river. Under the Agreement the area of irrigation allowed under the Krishnarajasagara is 125,000 acres; but this area can be increased by about 30,000 acres when the other reservoirs permissible in the valley are constructed, and the water now set apart for power generation from the Krishnarajasagara is released for irrigation. It is also permissible to increase the area under irrigation by improving the duty and by practising economies to extend the Canal even to areas beyond the Shimsha river, and thus bring under command additional land fit for cultivation. The total extent of irrigation that Mysore is entitled to under the Madras Agreement is 235,000 acres, and as remarked already, unless the region commanded by the proposed High Level Canal is fully exploited, there is not sufficient land commanded by the proposed reservoirs in other parts of the valley to realise irrigation to the fullest extent contemplated.

9. The progress made so far in extending irrigation, as stated above, consists only in the opening of the two low level canals immediately below the reservoir, capable of irrigating about 5,000 acres. Further development of irrigation has been delayed for various reasons, resulting in a large volume of water stored for purposes of irrigation being left unused in the reservoir; and if prompt action is not taken to extend irrigation, the country will be losing the benefit of this storage and the capital sunk on it will remain unproductive.

Proposed High Level Canal.

10. The Canal system proposed may be considered under three sections. The first section is 24½ miles long and is taken through broken country which makes it expensive to construct. The Canal has to be taken in deep cutting in several places and some large aqueducts have to be constructed to deal with the cross drainage. The canal embankments have to be constructed with special care. This length of canal will cost Rs. 74·65 lakhs and there will be little or no irrigation in this reach.

11. The second section of the canal involves the piercing of a tunnel 9,680 feet long, through a hill saddle, with deep cuts in continuation at either end. This alignment has been adopted after a thorough investigation of all possible alternatives. After inspection of the country between the river and the alignment selected for the tunnel, and consideration of the comparative estimates already prepared for alternative alignments, Sir M. Nethersole was of opinion that "the tunnel aligment will probably be the cheapest and it certainly is the most efficient alignment and the most economical of water." The cost of this section is estimated at Rs. 45·62 lakhs.

The tunnel has to be excavated in rock through a formation of gneiss and hornblende schist. The State Geologist has reported that the geological features of the site are favourable for this purpose. Some important tunnel works in other parts of India have been inspected while under construction by some of our Officers.

Full and up-to-date information has also been obtained as to methods of execution and cost, both in India as well as in some of the countries outside India. The methods of tunnel boring by the use of machinery are standardised and no special difficulty is anticipated in its construction.

12. The third section of the canal lies between the Karighatta range of hills, the Cauvery and the Shimsha rivers, and commands large tracts in the Mandya, Malvalli and T.-Narsipur Taluks which are subject to chronic drought. The area commanded has a maximum length of about 45 miles and a width of 25 miles at the widest part. The irrigable tract is studded over with numerous tanks which will serve to pick up the tail waters from canal irrigation. Branch canals and main distributaries will run along ridge lines, spreading the benefits of irrigation on both sides. This will be quite unlike the existing channels which run close to the river and serve only narrow strips of country on one side, along the river bank.

The population in the area is about 200,000 and the culturable land commanded is roughly 300,000 acres.

Cost of the Canal.

13. The estimated cost of the canal scheme, as given in the project herewith submitted, is as follows:—

			Rs.
(1) First section up to 24½ miles	...		74·65 lakhs
(2) Second or Tunnel section—			
(a) Open cutting	...	Rs. 14·16 lakhs.	
(b) Tunnel proper	..	Rs. 31·46 „	45·62 lakhs
(3) Third section	...		101·73 „
		Total ..	222·00 „

The estimate for the third section is approximate; but the sum provided for it is not likely to be exceeded when the details are worked out. Provision has been made for inspection lodges, roads, telephone lines and other equipment necessary for the effective control of irrigation.

System of irrigation proposed.

14. The revenue returns to Government and the benefits from the scheme to the country at large will depend to a considerable extent upon the nature of the crops cultivated and the methods of irrigation pursued. The ordinary method is to give water mainly for rice cultivation as is done in the Madras Presidency and in many parts of this State. If this method is followed here, the public will not be getting the full benefit to be expected from a perennial supply of this character.

It is well known that the cultivation of sugarcane is very much more profitable than rice, and that it will give employment to the people throughout the year. The Mysore raiyat is accustomed to the cultivation of sugarcane, but this crop is raised at present in small patches under tanks and wells. If, under the existing Cauvery channels, the cultivation of sugarcane has not appreciably developed in the past, it is partly because the supply of water could not be depended upon throughout the year and partly because sugarcane cultivation being expensive, the cultivators could not readily take to it as no arrangements exist at present to provide them with the necessary capital and other facilities. Now that a large reservoir has been constructed and a perennial water supply is practically assured, we should not be content with growing only seasonal crops like rice, but should also give attention to the cultivation of sugarcane and other valuable crops. Suitable measures should be adopted to prevent the wasteful use of water.

15. In developing a system of irrigation under this scheme, the following points should be kept in view:—

(1) Water should be utilised as far as possible for crops which will yield produce of the highest value, such as, sugarcane and garden crops.

(2) Water should be distributed economically so as to obtain the highest duties possible.

(3) Over-irrigation and saturation of the soil which lead to insanitary conditions should be avoided.

To fulfil these conditions, a suitable system of irrigation should be devised and steadily adhered to.

16. With proper regulation, one million cubic feet of water under this canal can and should be made to irrigate at least 2½ acres of sugarcane or 4 acres of rice or 10 acres of miscellaneous crops. The gross value of the produce from sugarcane may be taken at about Rs. 500 per acre, that from paddy Rs. 80 and from miscellaneous crops Rs. 50. In other words, one acre of sugarcane will use about 1·6 times the quantity of water required for an acre of paddy and will produce a crop of six times its value.

It is therefore necessary to give special encouragement to the growth of sugarcane and other valuable perennial crops. As sugarcane cannot be grown year after year on the same area, it is proposed to arrange for triennial rotation and to divide each irrigation plot into three parts, one part to be set apart for sugarcane or other perennial crops, one for rice and the third for miscellaneous crops, such as potatoes, onions, garlic, mulbery, etc. Only one-third of the area will be utilised for growing either sugarcane or paddy in any one year. To give time to cultivators to prepare for the cultivation of cane, they may be permitted in the first three years from the commencement of irrigation to grow miscellaneous crops in place of sugarcane. By that time it is hoped all reasonable facilities for growing cane will have been provided for the area.

17. The net irrigable area commanded by the High Level Canal will be about 180,000 acres. Of this, one-third, or 60,000 acres, will be left dry for sanitary reasons and to prevent over-irrigation of the tract. It is proposed to utilise one-third of the remaining area for sugarcane or perennial crops, one-third for rice and one-third for all miscellaneous crops. Such an arrangement besides being profitable to the raiyat is necessary to prevent the water-logging of the tract and the resulting unhealthiness. The detailed estimates for distributaries and branches in the third section will be prepared on this basis.

If the above system is adopted, the irrigation of 120,000 acres may be expected to give the following gross produce every year :—

	Value of gross produce. Rs.
(1) 40,000 acres of sugarcane and perennial crops yielding Rs. 500 per acre	200 lakhs.
(2) 40,000 acres of paddy at Rs. 80 per acre	32 ,,
(3) 40,000 acres of miscellaneous crops at Rs. 50 per acre ...	20 ,,
Total ...	252 ,,

If, on the other hand, the irrigation be solely confined to the rice crop, the total value of the produce at Rs. 80 per acre would be only about Rs. 96 lakhs. It will thus be seen that by growing crops of high value on a proper system, the total value of the produce under the canal will be about 2½ times that possible under the ordinary system of irrigation. Measures based on the latest experience and the best technical data available should be adopted if the State is to get the favourable results indicated above from this Canal.

Duty of water.

18. The "duty" of water may be defined as the relation between the volume of water and the area of crop matured by its means. As certain criticisms of the duties assumed in the project were brought to notice by Mr. K. R. Srinivasiengar before the Committee, the question will be briefly referred to here.

The criticisms are based on the duties realised under the existing channels in the Cauvery Valley running close to the river and irrigating narrow strips of land. These channels are usually worked by diverting into them as much of the river water as they can carry, and much of the water that passes through them returns to the river unutilised. Such channels bear no resemblance to the large canal systems intended to serve wide tracts of country and designed with an eye to proper regulation and control of water.

The following extracts from the remarks of Col. Ellis during the Arbitration very aptly describe the conditions of these Cauvery Channels.

* * * * *

"The existing channels were constructed without any regard to economy and flowing full, carry water at a very low duty and thus during the flow season June to October, give superabundant supplies to the areas, much of which supply returns to the river." (Page 884, Vol. III, Arbitration Proceedings, Mysore print).

* * * * *

"The irrigation duty of the Mysore Cauvery gauged by flow at the head is less than 30 acres per cusec, while the actual duty is probably 50 to 70 acres and the balance of water returns to the river." (Page 884, Vol. III Arbitration Proceedings, Mysore print).

* * * * *

"Can it be doubted that the narrow strip of the marginal cultivation under channels supplied at such duties return considerable quantity of water to the river?" (Page 885, Vol. III, Arbitration Proceedings, Mysore print).

Hence, arguments concerning the duties of water, based on the analogy of such channels, cannot be said to apply to a well designed canal system controlled by a reservoir, and served by a large canal like the proposed High Level Canal.

19. Further, the question was discussed at great length during the Arbitration and the duties finally agreed upon, were laid down authoritatively by Sir M. Nethersole. Summing up, Sir M Nethersole stated as follows:—

"The areas of irrigation adopted are those of Mysore Project and the duties are considered quite reasonable." (Page 185, paragraph 27, Vol. I, Arbitration Proceedings, Mysore print).

The foregoing extracts show that the duties have been accepted after due consideration by distinguished and experienced Engineers. The same or similar duties have been accepted also by successive Chief Engineers of this State.

20. The duties vary according to the crops, the seasons, the nature of soil, methods of irrigation, etc. The figures now assumed (*vide* paragraph 16 above) will be more intelligible because they give the number of acres of any particular crop which can be irrigated by a million cubic feet of stored water. It may also be pointed out that the actual average duty prevailing in the Cauvery Delta is about 55·77 or nearly 4 acres per Mcft., (pages 28 and 36, Vol. III, Metur Project) but that more than twice this duty (*i.e.*, 113 or about 7·7 acres for existing irrigation and 120 or about 8·2 acres per Mcft., for new irrigation, page 13, Vol. IV, Metur Project) is assumed in the Metur Scheme. This is much higher than the figures in the Mysore project. This again shows that, by means of the Metur Reservoir, Madras expect to realise far higher duties than those obtained at present. The duties realised in other parts of India are also not less liberal than what we have assumed.

It is worth noting here that the duties realised under the Periyar reservoir varied from 104 to 157 during the years 1908 to 1910 (Page 97, Madras Triennial Revenue Report).

21. The quantity of water available in the reservoir for the High Level Canal, after allowing for the irrigation of the two Low Level Channels and hot weather supplies for old irrigation, power generation and evaporation in the reservoir, is 35,718 Mcft. In the opinion of the technical members of this Committee this quantity will be more than ample for the irrigation of 120,000 acres.

Capital Cost and Financial Results.

22. If the High Level Canal project now estimated to cost Rs. 222 lakhs is also sanctioned, the total cost of the Reservoir Scheme, *i.e.*, the combined power and irrigation scheme will be as under:—

			Rs.
(1)	Cost of the reservoir including the two low level canals	...	253·00 lakhs.
(2)	Do Electric power	...	166·58 ,,
(3)	Do High Level Canal Project	...	222·00 ,,
	Total	...	641·58 ,,

Against this amount the expenditure already incurred is as follows :—

	Rs.
(1) Reservoir	220 lakhs.
(2) Electric power	135 ,,
(3) Irrigation	3 ,,
Total ...	358 ,,

It will be seen that the first two parts of this scheme are practically completed and it is only the construction of the High Level Canal that has lagged behind.

23. The returns to be expected from irrigation will depend on the total capital expended on the scheme, on the contribution realised for bringing the advantage of irrigation to the area and on the rates charged for the crops irrigated.

For lands in private holding brought under irrigation, it is proposed to levy an average contribution of Rs. 100 per acre. The Special Committee of 1921 recommended a rate of Rs. 80 to Rs. 100. Some appreciable amount may also be realised from contributions in respect of existing wet lands in the area.

The water rate recommended by the Special Committee is Rs. 10 per acre on the assumption that cultivation will be chiefly confined to rice. This Committee recommends that the irrigation of crops of the highest value should be encouraged and a proportionately high water rate charged.

We may mention that the Madras Government have decided to levy a water rate of Rs. 15 per acre for rice under the Metur Scheme, and that in the Bombay Presidency, rates as high as Rs. 50 to Rs. 60 are charged for sugarcane.

24. For purposes, however, of a rough estimate of revenue, the rates to be charged may for the present be assumed at Rs. 15 for sugarcane, Rs. 10 for rice and Rs. 5 for all other crops on the basis of a triennial crop rotation. These rates give an average of Rs. 10 per acre, which, on an area of 120,000 acres, will bring in a gross revenue of Rs. 12 lakhs. After deducting working expenses which may be taken at Re. 1-4-0 per acre, the net revenue will be Rs. 10·5 lakhs. Assuming that the contribution will be about Rs. 100 lakhs, the net outlay on irrigation may be taken at Rs. 122 lakhs. The net revenue calculated on this capital outlay to be incurred in future will be Rs. 10·5 lakhs, representing a return of 8·6 per cent.

25. The capital outlay already invested on the construction of the reservoir and the additional capital outlay on power development amounted to Rs. 207·56 and 99·37 respectively, or a total of Rs. 306·93 lakhs. The revenue during 1924-25 from the additional power developed and from the two Low Level Canals amounted to Rs. 20·11 lakhs. The net return in that year was nearly 6·6 per cent. The corresponding figures for 1925-26 were Rs. 328·52 lakhs and Rs. 14·16 lakhs respectively, giving a return of 4·3 per cent.

The sudden fall in the net revenue in the latter year is due to several causes, namely, reduced rates for power supply to the Mines which came into force during the year, fall in the quantity of power used by the Mines, fall in exchange and lastly increase of capital expenditure in the interval. The power consumption and revenue are expected to go up again.

26. The financial results of the entire scheme when completed may be estimated as follows :—

	Capital outlay	Anticipated net revenue
	Rs.	Rs.
Reservoir	250·00 lakhs	...
Power supply	166·58 ,,	29·75 lakhs
Irrigation	225·00 ,,	11·70 ,,
Deduct income from contribution	100·00 ,,	...
Total ...	541·58 ,,	41·45 ,,

Letter from the Chief Electrical Engineer dated 21st May 1927 attached herewith furnishes details of the revenue of Rs. 29·75 lakhs given above. The eventual total return expected from both power supply and irrigation is Rs. 41·45 lakhs on an aggregate outlay of Rs. 541·58 lakhs, or nearly 7·65 per cent.

27. It will be clear from the details given above that this anticipated net revenue of 7·65 per cent is for the new works only. The capital and the revenue due to Cauvery Power installation, before the reservoir came into operation, are both excluded from these calculations.

Our colleague Mr. K. R. Srinivasiengar has appended a note in which he raises doubts in regard to the realisation of the returns estimated here. In the case of productive works these returns are expected to be realised usually within ten years from the date water is made available.

In regard to accumulation of interest charges referred to, if there is a loss at the commencement, the works may yield a revenue much in excess of the interest charges on the capital, after the irrigation works come into full operation. In the case of productive irrigation works in British India no notice is taken of such charges although accounts are kept. It was quite recently ascertained that in the United States of America, the Federal Government spends money on irrigation works, and after they come into operation the State Governments which take over the works repay the capital gradually without including any charges for interest. The indirect benefits which both the Federal and State Governments derive by the creation of tax-paying properties and increase of production are expected to more than compensate for loss of interest charges.

For these reasons we regret we are unable to agree with the view taken by our colleague.

High Level Canal Project.

28. A list is attached showing the various plans, estimates and other documents submitted with the project, which have been prepared by the Special Officer, and under his supervision, by the Executive Engineer, Project Division. Detailed estimates have been furnished for the first and the second sections of the Canal together with the necessary plans, sections, reports and technical data and memoranda. Full details are available for the tunnel design. A comparative statement of the actual rates of execution on several important tunnels recently constructed in India is also attached to the estimate.

In regard to the third section, detailed surveys have been carried out, and the contoured plans submitted indicate the features of the country in considerable detail. As the design of distributaries and other channels will depend on the system of irrigation to be adopted, the estimates for them are necessarily approximate. Information in regard to agricultural statistics relating to land, population, soils, tanks in the locality, etc., is also appended.

Type designs have been prepared in numerous cases.

In a work of this kind, minor changes and deviations will be necessary in the course of the execution of the project. Trial pits have been taken in sufficient number at the crossing of streams and *nalas*. More trial pits may be taken with advantage along the canal sections, and working estimates prepared for guidance in actual execution. Generally speaking, in our opinion no works should be started without separate working estimates. The Special Officer should be instructed to complete all working estimates and to submit a comparative table indicating deviations in cost, if any, within six months from the commencement of the work. In other respects the project is based on up-to-date data and practices and is satisfactory.

29. The Members of the Committee, with the exception of Mr. K. R. Seshachar, wish to place on record their high appreciation of the ability and technical skill shown by the Special Officer (Mr. K. R. Seshachar) and his staff in the preparation of this project.

Programme for execution of the scheme and grants required.

30. The amount required for completing the first and the second sections and such works in the third section as would be required to bring nearly 60,000 acres under irrigation will be roughly Rs. 180 lakhs.

The grants required from year to year for a five year programme may be taken as under:—

	Rs.
1927-28	30 lakhs.
1928-29	40 ,,
1929-30	40 ,,
1930-31	40 ,,
1931-32	30 ,,
Total ...	180 ,,

By the time these works are carried out, contributions may be coming in and it should be possible to carry out the remaining works from that source.

31. The Committee are emphatically of opinion that the Canal Works should be completed as expeditiously as possible in order to secure an early return on the capital expended and the time required for the completion of the work should, if practicable, be shortened. If experience shows that greater progress can be secured, the Special Officer should be permitted to apply for larger grants than those provided for.

General Remarks.

32. We have said enough to explain why it is necessary to adopt a special system of irrigation under the proposed High Level Canal, and to charge water rates suited to that system and to the special conditions of irrigation in this region. We have assumed that crops of the highest value should be cultivated and to do this successfully, the present routine methods of irrigation should be abandoned and a suitable system of crop rotation introduced. A suitable organisation will be necessary in other respects also to secure the co-operation of the people. By means of Committees, Co-operative Societies, Joint Stock Companies, etc., working under the supervision of Government it will be possible and necessary to provide the cultivators with working capital and manures, with pumps, sugarcane mills, machinery, tools, etc. These questions are receiving the attention of the Committee and detailed proposals will be submitted in due course.

33. At the commencement we propose to charge an average rate of only Rs. 10 per acre for a period of six years but it will be open to Government to raise the rate at the end of that period in the light of experience gained.

34. As is usual in such cases, the scheme has undergone changes in design and the capital outlay has gone up, partly owing to the increased cost of labour and materials since it was designed in 1911. The reservoir construction has gone on leisurely, the power development has been pushed forward more rapidly than was intended and irrigation has lagged behind. The Madras Arbitration has also altered the conditions and added to the cost. With all these changes and disadvantages, the remunerative character of the scheme has not altered. At present the return on the capital expended has varied within the past three years from 4 to 6 per cent. This result, in a combined scheme of this character within 15 years of its commencement, cannot be regarded as otherwise than satisfactory. There are probably only two or three large reservoir schemes of this kind in the whole of India constructed by Government, which are paying a higher return than this one; but even in their case not one of them has given such favourable results in so short a time.

Summary of Recommendations.

35. We find the project in every respect feasible and that it involves no great difficulties of engineering or construction other than those arising from its large size and cost. Our recommendations may be summarised as follows:—

(1) Administrative sanction may be accorded to the entire Canal Project estimated to cost Rs. 222 lakhs.

(2) Detailed estimates for the first and second sections of the Canal embodied in the project which in the aggregate amount to Rs. 120·27 lakhs, are in order and may be sanctioned.

(3) The programme of expenditure for five years indicated in paragraph 30 may be provisionally approved, not perhaps as a definite commitment but as an indication of Government policy that funds will be provided as fast as they are needed to carry the work to completion.

(4) Steps may be taken to have an Irrigation Act passed by the Legislature as early as possible.

If the foregoing recommendations meet with approval, we suggest that orders may be given to commence the construction of the first two sections of the High Level Canal without delay.

36. Detailed proposals and estimates for the third section of the canal will be completed and submitted for sanction separately, one by one. We may, however, add from our present knowledge of the circumstances of the area to be served, we do not expect that the total cost of this section will exceed the rough estimate of Rs. 101·73 lakhs given above.

37. The system of irrigation proposed, the contribution to be recovered and water rates to be charged will be further referred to in dealing with the third or irrigation section of the project.

It only remains for us to add that this large power supply and irrigation scheme is unlike any other hitherto constructed in the State. To be successful, it should be provided with efficient and up-to-date organisations to deal with all its special wants. No pains should be spared to develop irrigation in accordance with the latest practices and with an eye to the highest returns. The policy indicated in this report should be steadily pursued for at least 15 years from the date Government begin to give water for irrigation. If the policy pursued is halting, and some measures and methods among those recommended are accepted and some omitted, the scheme will be weakened and in that case the profits to the people and the returns to Government we have estimated may not be fully realised.

The area to be brought under irrigation is a compact block measuring 800 to 900 sq. miles of country, the greater part of which is well suited for the irrigation of sugarcane and other valuable crops. The Cities of Mysore and Bangalore are situated within 22 and 52 miles respectively, and the tract is within easy reach of men of enterprise and capital.

The potentialities of the scheme for increasing the wealth of the people and creating tax-paying properties for the State are very great. The gross value of produce from the 120,000 acres may, in course of time, amount to Rs. 2½ to 3 crores annually, representing an addition of 10 to 15 per cent to the present agricultural wealth of the Mysore State.

BANGALORE,
19th—22nd May 1927.
K. NARAYANA IYENGAR,
Secretary to the Committee.

M. VISVESVARAYA
*K. R. SRINIVASIENGAR
B. SUBBA RAO
H. NANJUNDARAJ URS
B. NARASINGA RAO
K. R. SESHACHAR

* *Subject to remarks in Note attached*

Copy of D. O. No. 1354, dated the 21st May 1927 from the Chief Electrical Engineer to the Government of Mysore, to the Special Officer, Krishnarajasagara Works, Bangalore.

I have your D. O. No. 703—C. dated the 21st instant and I have discussed with Mr. G. Seshagiri Rao, the Electrical Department's revenues as they are estimated to be after the completion of the VII Installation, and in comparison with the net revenue before the IV Installation began to affect it.

The revenues of 1913-14 were affected by the IV Installation, as additional power to some considerable extent was given to the Mining Companies and supplied by the overload capacity of the first, second and third installation. I have therefore taken the net revenue of the year 1912-13 as the last year in which the Cauvery Reservoir Scheme did not affect the revenues of the C. P. S. However the revenues of 1913-14 were somewhat less than that of 1912-13, but this was on account of the prolonged water shortage during the hot weather months of 1914, which resulted in rebates to the extent of approximately Rs. 2 lakhs. The dividing line cannot be taken from the 15th July 1915, the date on which the power supplied to the Mining Companies became protected power and the £ 12 per H.P. came into effect.

The gross revenue will, after all of the power of the VII Installation is taken up be Rs. 60·5 lakhs with operating expenses at Rs. 20 lakhs leaving a net revenue of 40·5 lakhs of rupees per annum.

The net revenue in 1912-13 was Rs. 10·75 lakhs and therefore the increase in the net revenue of the Electrical Department, on account of the IV, V, VI and VII Installations, will be Rs. 29·75 lakhs.

When the VII Installation estimates were sent up, they were based upon a gross revenue of Rs. 143 per annum per maximum H. P. generated at Sivasamudram, but by reason of the rate of exchange being fixed at Rs. $13\frac{1}{3}$ per pound sterling instead of the Rs. 15, which was used in the VII Installation reports for calculating the revenues and by reason of the several reductions in the rates of power, the annual revenue per maximum H. P. per annum is now Rs. 131.

The capital outlay of the C. P. S. to the end of 1912-13 was Rs. 83·42 lakhs, and it is estimated that the capital outlay after all of the power from the VII Installation is taken up and the electrification of the several towns is completed, will be Rs. 250 lakhs.

KRISHNARAJASAGARA HIGH LEVEL CANAL PROJECT.

LIST OF REPORTS, PLANS, ESTIMATES, ETC., COMPRISING THE PROJECT.

I. SECTION.

1. Report by the Special Officer on the Project.
2. General Abstract of Estimates.
3. Note on technical points and memorandum on rates.
4. Drainage and discharge statements—with calculations.
5. Detailed estimates.
6. Plan showing soil survey and general alignment.
7. Plan showing the whole of Cauvery Valley and Krishnarajasagara and other reservoirs and possible Canals.
8. Longitudinal Sections of Canal.
9. Plans and type designs of masonry works.

II. SECTION.

1. Abstract of estimates with data for rates.
2. Technical memoranda on various points.
3. Detailed estimates.
4. Plans.

III. SECTION.

1. Approximate estimate for the Third Section.
2. Register of Agricultural Statistics and statement of irrigable areas.
3. Statement of tanks in the High Level Canal area.
4. Specimen plans showing contours.

GENERAL.

Statement showing the responsibility of Officers and subordinates in the preparation of the Project estimates and their check.

2. Report by the Special Officer and the Executive Engineer on the results of a comprehensive investigation of all possible reservoirs and canals in the Cauvery Valley.

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ಪ್ರಾಪ್ತಿ ಕ್ರಮಾಂಕ Accession No. 2458(B)
ದಿನಾಂಕ Date.....

Note dated 22nd May 1927 by Mr. K. R. Srinivasiengar.

In the preparation of the High Level Canal Project the area *ultimately* irrigable by the canal has been taken at 120,000 acres on the basis of a duty of 71 acres per cusec for paddy and corresponding duties for sugarcane and tadi crops. Doubts have, however, been expressed in certain quarters about such high duties being realisable under the canal and a note has been furnished to the Committee by Mr. T. Paramasiva Iyer (Retired Judge of the Chief Court), in which he asserts that it is not possible to obtain a duty of more than 18 under the Canal and that, at this rate the storage in the reservoir cannot, after making allowance for evaporation, loss in transit, power generation at Sivasamudram, etc., do duty for more than 30,000 acres under the Mandya Canal. This view does not find support from any Engineer Officers. Mr. C. T. Dalal who as Superintending Engineer in Mysore for a long time had considerable experience of irrigation works in the State has, when questioned before the Krishnarajasagara Committee of 1921 about the duty realisable under the High Level Canal, stated that considering that an average duty of 25 is being obtained now under the river channels in the State which hug the river and in respect of which 50 per cent of the water passed on the lands gets back into the river, a duty of 40 may be reasonably expected in an extensive and comparatively flat area like that commanded by the High Level Canal. If, as stated by Mr. Dalal, a duty of 40 can be obtained in the High Level Canal area even under the present wasteful methods of the use of water by the raiyats, it should be possible to secure 50 per cent more by the adoption of suitable measures to prevent wastage. The Technical Members of the Committee—Messrs. K. R. Seshachar and B. Subba Rao—as also the distinguished Chairman, are emphatically of opinion that with an effective system of water distribution and regulation, the duties assumed for the project—which have been approved by Sir M. Nethersole and Col. Ellis—are quite realisable and that the supply in the reservoir will be quite sufficient for irrigating an area of 120,000 acres particularly under the proposed system of triennial rotation according to which not more than 40,000 acres will be ever under paddy in any one year. In a matter of this kind one has to defer to the opinion of experts. I shall therefore accept the view of the Technical Members of the Committee. But even assuming that the high rates anticipated by them can be realised, such realisation can be obtained only gradually and in course of time, as irrigation is developed under the Canal and the raiyats get accustomed to the economical use of water. For this reason and also in view of the fact that the expansion of irrigation, though it may be rapid at the first onset, will as years go on, become more and more slow, as it will depend not merely on the supply of water but also on other factors, such as the resources of the people, the demand for land, the labour supply available in the locality, etc., I am of opinion that to bring 60,000 acres under irrigation and obtain full assessment thereon it will take at least 10 years after water supply is made available from the channel and that a further period of at least ten years will be required to secure an irrigated area of 80,000 acres. Any further extension beyond this extent will, in my opinion, be very slow, and it may perhaps take half a century before the whole of the contemplated area of 120,000 acres is, if at all, brought under irrigation.

2. The financial prospects of the project (1) with an area of 60,000 acres under the Canal, (2) with 80,000 acres and (3) with 120,000 acres will be as follows :—

	For 60,000 acres.	For 80,000 acres.	For 120,000 acres.
(1) Cost of the project.—	Rs.	Rs.	Rs.
(i) To complete the reservoir	30 lakhs	30 lakhs	30 lakhs
(ii) For the first and second sections of the Canal.	120 ,,	120 ,,	120 ,,
(iii) For the third section of the Canal ...	60 ,,	80 ,,	100 ,,
Total cost ...	210 ,,	230 ,,	250 ,,
Deduct contribution at Rs. 100 per acre for 60,000 and 80,000 acres and Rs. 80 per acre for 120,000 acres.	60 ,,	80 ,,	100 ,,
Net cost ...	150 ,,	150 ,,	150 ,,
(2) Net revenue, (water rate) at Rs. 8-12-0 per acre.	5·25 ,,	7 ,,	10·5 ,,
(3) Percentage of return to net capital cost ...	3·5	4·67	7·0

It may be noted that in the above calculations, (1) the figures for the estimated cost of the work have been taken as given by the Public Works Department though, judging from past experiences, the chances are that they may be exceeded, and (2) that the contribution has been taken at an average of Rs. 100 per acre though this is the maximum rate recommended by the Krishnarajasagara Committee of 1921. To the extent that the cost of the work exceeds the estimate or the realisations from contributions fall short of expectation, the percentage of return to capital will be correspondingly reduced. On the other hand, if the water rate of Rs. 10 which is proposed to be fixed tentatively for six years in the first instance is enhanced, there will be a corresponding increase in the anticipated return.

3. Taking it that, in accordance with the programme of works proposed by the Committee, the execution of the canal work will be completed and water made available for irrigation in five years and that water rate will, as was done for the low level canal lands, be recovered at progressive rates spread over 3 or 4 years, it will be observed from the calculations in paragraph 2 above, that for the first eight years there will be practically no return on the large outlay of over Rs. 1¾ crores expended on the work, that the return at the end of 20 years, when about 60,000 acres may be expected to be brought under irrigation, will be only about 3·5 per cent and that it will take at least 30 years before a return of 5 per cent can be realised.

4. Though a return of even 3·5 per cent at the end of 20 years must be considered satisfactory for an irrigation work of this magnitude, the question whether the work may be started at once or should be deferred for a time will depend on the capacity of Government to finance it. Dealing with this same High Level Canal Project, in a note dated 5th September 1919 the then Financial Secretary, Mr. M. N. Krishna Rao (now Member of Council) stated as follows:—

"It is out of the question to borrow funds at a high rate of interest and invest them in a losing concern. To finance from loan funds a large work costing crores which will admittedly not pay for a long period is simply to place the burden of interest charges on the tax-payer. There are doubtless many indirect benefits from a large irrigation project both to Government and the people. If an irrigation work should be sanctioned on the ground of its indirect advantages, it is necessary to frankly recognise it as a protective work and undertake it only when it is possible to finance it from current or accumulated revenue surpluses."

I am in full accord with the above views of Mr. Krishna Rao. Though the High Level Canal Project is eventually expected to yield more than 5 per cent the return from it will not be sufficient to cover the interest on the capital for a period of 25 or 30 years. It will therefore have to be treated as a protective rather than a productive work for the present. It is however a protective work of the greatest importance and usefulness, as it will practically insure against famine the large tract commanded by the Canal, and materially add to the wealth of the people of the State, and I would therefore unhesitatingly recommend its being taken up at once if the funds required therefor can be obtained from accumulated or current surpluses or in any other manner without resort to a loan. But if the project can only be financed by a loan, it will be a matter for consideration how far it will be possible to meet from the current revenues the sinking fund required for the discharge of the loan as well as the annual interest charges which alone, even at the moderate rate of 5 per cent below which no loan can possibly be now raised, will amount to from 1·5 to 9 lakhs per annum during the first eight years before the project begins to yield and will then gradually go down after deducting the net receipts from water-rate to 2·5 lakhs per annum at the end of about 20 years and may be fully covered by the revenue receipts in about 30 years. This is a matter which the Government alone can decide in consultation with their financial advisers and the Legislative Council. In the circumstances, I think that the Committee cannot take it on itself to recommend the immediate commencement of the work without any heed to the financial position of the State and that all that the Committee can do, is to place the above mentioned aspects of the project before Government with a recommendation that, in view of the immense advantage which will be derived from the scheme, it may be taken up as early as possible with due regard to the finances of the State.

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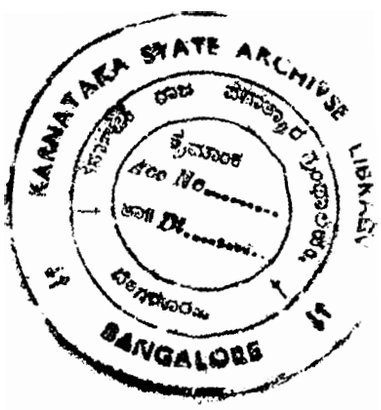

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